

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Original) A method of patterning a substrate according to a predetermined path, said method including forming a liquid film on the substrate surface and directing laser energy from a laser through the film to etch the substrate surface, wherein etched material is carried away from the substrate surface via evaporation of the film during said etching.
2. (Original) The method of claim 1, wherein the liquid film is formed on the substrate surface by jetting a liquid vapour onto the substrate surface.
3. (Currently Amended) The method of claim 2, wherein the liquid vapour comprises at least one component selected from the group consisting ~~is composed of one~~ of water, an alcohol, an inert liquid, and a non-reactive liquid.
4. (Previously Presented) The method of claim 2, wherein the thickness of the liquid film is in the range of several micrometers to several tens of micrometers.
5. (Previously Presented) The method of claim 1, wherein the liquid vapour is jetted with a gas to carry the liquid vapour onto the substrate surface.
6. (Currently Amended) The method of claim 5, wherein the gas comprises at least one component selected from the group consisting ~~in one~~ of nitrogen, compressed air, oxygen, and an inert gas.

7. (Previously Presented) The method of claim 1, wherein the laser directs laser energy in pulses of predetermined duration.

8. (Original) The method of claim 7, wherein the pulse duration is the range of 1 to 100ns.

9. (Previously Presented) The method of claim 1, wherein the laser fluence of the laser is more than the etching threshold of the substrate.

10. (Original) The method of claim 9, wherein the laser fluence is more than 150 mJ/cm².

11. (Previously Presented) The method of claim 1, wherein the substrate surface has an ITO film onto which the liquid film is formed.

12. (Previously Presented) The method of claim 1, wherein the substrate has one or more layers.

13. (Original) The method of claim 12, wherein at least one layer of the substrate is silicon oxide.

14. (Original) The method of claim 13, wherein the silicon oxide layer is the top layer of the substrate.

15. (Previously Presented) The method of claim 1, wherein the substrate is substantially composed of glass, quartz and/or silicon.

16. (Previously Presented) The method of claim 1, wherein the substrate is an ITO film IC package, silicon wafer, conductor, semiconductor or insulator.

REMARKS

As a preliminary matter, Applicants submitted an Information Disclosure Statement on October 9, 2003. Applicants respectfully request an initialed copy of the PTO-1449 form submitted therewith.

Claims 3 and 6 stand rejected under 35 U.S.C. §112, second paragraph for indefiniteness. In particular, the Examiner states that these claims are unclear because of improper Markush group terminology. In an effort to accommodate the Examiner's wishes, Applicants have amended claims 3 and 6 as requested by the Examiner. But this amendment is not a narrowing amendment that surrenders any subject matter originally claimed. Withdrawal of the rejection under 35 U.S.C. §112, second paragraph is respectfully requested.

Claims 1-10, 12-16 stand rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent 5,075,184 to Gupta et al in view of U.S. Patent 6,177,358 to Douglas. All claims 1-16 are rejected under 35 U.S.C. §103 as being unpatentable over Gupta in view of Douglas and admitted prior art. These rejections are respectfully traversed.

Gupta teaches immersing a substrate 28 in a liquid-filled container 10. As recognized by the Examiner, Gupta fails to disclose "forming a liquid film on the substrate surface."

The secondary Douglas reference describes photo-simulated etching of CaF_2 . The Examiner relies on the second embodiment illustrated in Figure 3 in which a thin layer of condensed water 26 is formed on the CaF_2 surface in an evacuated chamber 22. After

radiating the CaF_2 with photoenergy 18, the "chamber 22 is evacuated, removing all of the water vapor 24, condensed water 26, and etched CaF_2 . Optionally, the substrate can be rinsed with water for five seconds, for example, and then dried with nitrogen gas to remove CaF_2 reaction products." Column 5, lines 33-37. Hence, it is clear that the etched material is carried away, not by "evaporation of the film during said etching," as recited in claim 1, but rather by active evacuation of the chamber or rinsing with water.

There are additional reasons why the attempted combination of Douglas and Gupta is improper. Douglas explicitly teaches that the substrate beneath the CaF_2 surface is not etched. See for example, column 3, lines 59-61, and column 5, lines 57-64. A person of ordinary skill in the art would therefore understand that Douglas is limited to photo-simulated etching of only CaF_2 and would be taught away from combining Douglas's etching method, in which the substrate is purposely protected from etching, with Gupta's substrate etching technique.

It is impermissible within the frame work of Section 103 to pick and chose from any one reference only so much as will support a given position to the exclusion of other parts necessary to the full appreciation of what such references fairly suggest to one ordinary skill in the art. *Bausch & Lomb, Inc. v. Barnes-Hind, Inc.*, 796 F.2d 443 (Fed. Cir. 1986); *In re Hedges*, 783 F.2d 1038 (Fed. Cir. 1986). Because Douglas excludes the possibility of etching the substrate, one can not be expected to combine it with Gupta whose very goal is to etch the substrate. *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

In addition, a proposed modification that renders the prior art in operable for its intended purpose is inappropriate for an obvious inquiry. *In re Fritch*, 972 F.2d 1260, 1265-1266 (Fed. Cir. 1992). In this case, the Examiner's proposed modification requires that Douglas be modified in a fashion that is explicitly contrary to Douglas' teachings at column 3, lines 59-61, and column 5, lines 57-64.

The Examiner indicates that forming a liquid film is a "useful" alternative to immersing the material to be etched in a liquid bath. But Douglas' teachings do not prove any "usefulness" of a liquid film over a liquid bath. Douglas does not even hint that forming a liquid layer possesses any particular advantage over the liquid bath. It is understood from a reading of the entire Douglas patent that the thin water layer embodiment is merely an interchangeable alternative to the bath immersion embodiment.

The Federal Circuit has indicated that the problem confronted by the inventor must be considered in determining whether it would have been obvious to combine references in order to solve that problem. *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 934 (Fed. Cir. 1990). In this case, the inventors Song et al. point out in the background that laser etching methods have certain problems including residue or contaminants from the etching process remaining in the solution redepositing onto the substrate, causing an undesirable etching pattern. Douglas fails to appreciate the significance of carrying away any residue material resulting from etching by laser-induced evaporation of the thin liquid film in order to avoid undesirable redeposition.

The claimed invention also has advantages over Gupta in that, for example, no filter is required to trap etched particles, and water recirculation is not needed. Moreover, by eliminating immersion of the substrate into a liquid bath, the risk of damaging the substrate, in particular those substrates sensitive to liquid, is avoided. Liquid consumption is minimal since a liquid bath is not required. Significantly, the claimed invention eliminates the formation of shoulder-structures at the rim of the etching line, (e.g., see Figures 2B, 3B, 4B, and 5B), as well it enhances the etching rate.

Since the rejection of claim 1 is improper, there is no need to address additionally distinguishing features of the dependent claims. However, Applicants do not acquiesce to the Examiner's statement that the thickness of the liquid film in Douglas would have been obvious. Douglas does not provide any thickness let alone attribute criticality to the thickness of the liquid film. There is certainly no disclosure or suggestion of using a liquid film in the range of several micrometers to several tens of micrometers recited in claim 4. As explained in MPEP section 2144.05 III, the Examiner's case for obviousness is rebutted "by showing that the art, in any material of respect, teaches away from the claimed invention." See page MPEP page 2100-38. Applicants have established above that Douglas teaches away in a material aspect, namely, purposefully avoiding etching the substrate. Moreover, Applicants does not agree with any other of the Examiner's assertions that particular materials or ranges are obvious.

The application is condition for allowance. An early notice to that effect is earnestly solicited.


SONG et al.

.. Appl. No. 10/078,382
December 31, 2003

Respectfully submitted,

NIXON & VANDERHYE P.C.

By:



John R. Lastova
Reg. No. 33,149

JRL:at

1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100